

Applicant : Nikil Dutt et al.  
Appl. No. : 10/599,593  
Examiner : Jue S Wang  
Docket No. : 703538.4054

### Amendments to the Claims

This listing of claims will replace all prior versions and listings of claims in the application:

1-27. (Canceled)

28. (New) A method of simulating an instruction set architecture (ISA) with an instruction set simulator (ISS), comprising:  
generating decoder source code, prior to a simulation time, by decoding each instruction of a plurality of instructions in an original input application, wherein the decoding comprises:  
identifying a plurality of unique instruction patterns across a plurality of input applications;  
selecting an appropriate template from a plurality of templates for each unique instruction pattern of the plurality of unique instruction patterns, wherein each template of the plurality of templates is configured to implement a functionality of an instruction contained within an instruction class, the instruction class describing a set of instructions of the instruction set architecture having a common behavior;  
generating a customized template for each instruction of the plurality of instructions using parameter values contained in the instruction;  
instantiating the customized template; and

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appending the customized template and corresponding instantiation code into the  
decoder source code;  
compiling the decoder source code to generate an optimized decoder having optimized  
decoded instructions;  
loading, at a simulation time, the optimized decoded instructions into instruction memory;  
fetching, at a run time, an instruction binary of an optimized decoded instruction from  
instruction memory;  
decoding, at the run time, a modified instruction that has been modified since a time of  
decoding to generate a redecoded instruction by selecting one of an optimized  
decoded template or a decoding mechanism comprising function pointers; and  
executing one of the optimized decoded instruction or the redecoded instruction.

29. (New) The method of claim 28, wherein each template has a corresponding mask  
usable to identify instructions belonging to the instruction class.

30. (New) The method of claim 29, wherein selecting an appropriate template comprises  
comparing the instruction to the mask corresponding to the template and selecting  
the template if the mask matches the instruction.

31. (New) The method of claim 28, wherein executing comprises using an interpretive  
process.

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32. (New) A system, comprising:

a processor; and

a computer readable medium having stored thereon a generic instruction model, the

generic instruction model executable by the processor in an instruction set simulator (ISS), the generic instruction model comprising an instruction specification usable to interpret each instruction in an instruction set architecture (ISA), wherein the instruction set simulator is configured to perform

generating decoder source code, prior to a simulation time, by decoding each instruction of a plurality of instructions in an original input application, wherein the decoding comprises

identifying a plurality of unique instruction patterns across a plurality of input applications;

selecting an appropriate template from a plurality of templates for each unique instruction pattern of the plurality of unique instruction patterns, wherein each template of the plurality of templates is configured to implement a functionality of an instruction contained within an instruction class, the instruction class describing a set of instructions of the instruction set architecture having a common behavior;

generating a customized template for each instruction of the plurality of instructions using parameter values contained in the instruction;

instantiating the customized template; and

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appending the customized template and corresponding instantiation code into the  
decoder source code;  
compiling the decoder source code to generate an optimized decoder having optimized  
decoded instructions;  
loading, at a simulation time, the optimized decoded instructions into instruction memory;  
fetching, at a run time, an instruction binary of an optimized decoded instruction from  
instruction memory;  
decoding, at the run time, a modified instruction that has been modified since a time of  
decoding to generate a redecoded instruction by selecting one of an optimized  
decoded template or a decoding mechanism comprising function pointers; and  
executing one of the optimized decoded instruction or the redecoded instruction.

33. (New) The system of claim 32, wherein the instruction specification comprises one  
or more operation classes, wherein each operation class defines a set of one or  
more instructions, the operation class having an operation mask usable to identify  
instructions belonging to the class.

34. (New) The system of claim 33, wherein the operation class comprises one or more  
symbols and an expression describing the class in terms of the one or more  
symbols, each symbol having a corresponding set of one or more symbol types,  
each symbol type in the set comprising information usable to determine the symbol  
when compared to the instruction.

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35. (New) The system of claim 34, wherein the type set comprises a plurality of operation types, each operation type having a corresponding type mask usable to determine the operation when compared to an instruction.
36. (New) The system of claim 33, wherein at least one operation class comprises a plurality of expressions, each expression being conditional on data within the instruction.
37. (New) The system of claim 33, wherein each instruction comprises a series of slots, each slot comprising data translatable into an operation.
38. (New) The system of claim 33, wherein each instruction comprises a series of binary data values and an operation mask comprising a series of mask positions wherein each mask position corresponds to one instance of a binary data value.
39. (New) The system of claim 38, wherein each mask position has a value selected from a group consisting of a binary one value, a binary zero value, and a do not care value.
40. (New) A computer readable medium having stored thereon a set of instructions executable by a machine to perform operations for simulating an instruction set architecture (ISA), said operations comprising:

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generating decoder source code, prior to a simulation time, by decoding each instruction of a plurality of instructions in an original input application, wherein the decoding comprises:

- identifying a plurality of unique instruction patterns across a plurality of input applications;
- selecting an appropriate template from a plurality of templates for each unique instruction pattern of the plurality of unique instruction patterns, wherein each template of the plurality of templates is configured to implement a functionality of an instruction contained within an instruction class, the instruction class describing a set of instructions of the instruction set architecture having a common behavior;
- generating a customized template for each instruction of the plurality of instructions using parameter values contained in the instruction;
- instantiating the customized template; and
- appending the customized template and corresponding instantiation code into the decoder source code;
- compiling the decoder source code to generate an optimized decoder having optimized decoded instructions;
- loading, at a simulation time, the optimized decoded instructions into instruction memory;
- fetching, at a run time, an instruction binary of an optimized decoded instruction from instruction memory;

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decoding; at the run time, a modified instruction that has been modified since a time of decoding to generate a redecoded instruction by selecting one of an optimized decoded template or a decoding mechanism comprising function pointers; and executing one of the optimized decoded instruction or the redecoded instruction.

41. (New) The computer readable medium of claim 40, wherein the template corresponds to a first class of one or more instructions and wherein the template has a corresponding mask usable to identify instructions belonging to the first class.

42. (New) The computer readable medium of claim 40, wherein executing comprises using an interpretive process.